DISCARD

Daniel Pratt Cotton Gin Factory
Prattville, Alabama
AUTAUGA Co.

HABS No. ALA-~~686~~ 685

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HISTORIC AMERICAN ENGINEERING RECORD

DANIEL PRATT COTTON GIN COMPANY FACTORY COMPLEX

(Continental Gin Co.)
AL-5

DATE:	1838-1848
LOCATION:	Spanning Autauga Creek Prattville, Alabama
DESIGNED BY:	unknown
OWNER:	Continental Gin Company
SIGNIFICANCE:	The site was acquired by Daniel Pratt in 1838, and he soon established grist and lumber and shingle mills there. By 1844, he had opened a cotton gin plant, the products of which were in great demand before the Civil War, and which became the largest cotton gin producer in the world. The Daniel Pratt Cotton Gin Company merged with other manufacturers in 1899 to form the Continental Gin Company which, in 1966, was still operational in Prattville. Pratt was also instrumental in the development of Alabama's iron and coal industries--reconstructing the Red Mountain Iron and Coal Company after the Civil War.
TRANSMITTED BY:	Monica E. Hawley, Historian, 1983

CONTINENTAL GIN COMPANY
(Samuel Gristwold & Company)
(Daniel Pratt Gin Company)
(Continental/Moss-Gordon Company)
(Bush Hog/Continental Gin Company)
(Continental Eagle Corporation)
Prattville
Autauga County
Alabama

HAER No. AL-5

ADDENDUM TO
DANIEL PRATT COTTON GIN COMPANY,
FACTORY COMPLEX
Prattville
Autauga County
Alabama

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Washington, D.C. 20240

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HISTORIC AMERICAN ENGINEERING RECORD

CONTINENTAL GIN COMPANY
(Samuel Griswold & Company)
(Daniel Pratt Gin Company)
(Continental/Moss-Gordon Company)
(Bush Hog/Continental Gin Company)
(Continental Eagle Corporation)

HAER No. AL-5

Location:	Prattville, Autauga County, Alabama
Date of Construction:	circa 1848
Fabricator:	various
Present Owner:	Continental Eagle Corporation
Present Use:	Cotton gin and systems manufacturing
Significance:	Continental Eagle Corporation, currently the largest producer of cotton ginning equipment in the world, is the oldest continuously-operated industrial complex in the state of Alabama, dating to the founding of the Daniel Pratt Gin Company in 1833. Prattville held a diverse antebellum manufacturing establishment, of which the gin manufactory was the mainstay. The earliest Continental Eagle buildings, which date from the mid-19th century, are virtually the only architectural remnants of antebellum Alabama's nascent industrial efforts.
Historian:	LeeAnn Bishop Lands, August 1997

Project Information:

This recording project is part of the Historic American Engineering Record (HAER), a program documenting historically significant engineering and industrial sites in the United States. The HAER program is part of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER), a division of the National Park Service. Continental Eagle Corporation facilitated access to the site, and made available supplies and equipment. Tommy Brown provided invaluable assistance on-site as well as unlimited access to carefully preserved original Pratt and Continental documents. His constant attention to the success of the project is greatly appreciated. Ann Boutwell, Cindy Creamer, Larry Nobles and others at the Prataugan Museum and Autauga Heritage Center provided office space, supplies, access to their collection of documents and records, and a most congenial working environment. Their support made this documentation possible.

CHRONOLOGY

1833	Daniel Pratt begins manufacturing cotton gins at Elmore's Mill (near Wetumpka), Alabama.
1834	Gin manufactory moves to McNeil's Mill, Alabama (about two miles downstream of Prattville).
1835	Pratt purchases land further up Autauga Creek where he eventually founds Prattville.
c.1839	Completion of new Prattville cotton gin manufactory on east side of Autauga Creek.
c.1848	Pratt erects 3-story masonry factory on site of former grist mill. The new structure is used as a sash, door, and blind factory, later to become part of the gin manufactory.
1850	Samuel and Elisha Griswold become partners in the gin company, temporarily named S. Griswold & Co.[1]
c.1852	3-story masonry machine and carpenter shop erected adjacent to c.1848 factory. The structure later is used as part of the gin manufactory.
1853	Samuel and Elisha Griswold withdraw from E.C. Griswold & Co. Name changes to Daniel Pratt Gin Company.
1854	Pratt moves gin factory to new three-story structure on the west side of the creek, adjacent to the c.1848 building.
1873	Death of Daniel Pratt. Nephew Merrill E. Pratt and daughter Ellen Pratt DeBardeleben become owners.

[1]U.S. Bureau of the Census, 1850, *7th Census of the United States, Manufactures* (manuscripts), Alabama Department of Archives and History (hereafter referred to as ADAH). The manuscripts show the name of the gin company as E.C. Griswold and Co. during those years. Other sources report the name as S. Griswold & Co.

1881	Merrill E. Pratt buys DeBardeleben interest in company and becomes sole owner, with exception of small interest held by W.T. Northington.
1889	Death of Merrill E. Pratt. Business continues, operated by estate with son Daniel Pratt in charge.
1898	Three-story masonry structure added to expand gin factory operations. Steam power added to operate this building's machinery.
1899	Daniel Pratt Gin Company merges with Munger Improved Cotton Machine Mfg. Co. (Dallas, TX), Northington-Munger-Pratt Co. (Birmingham, AL), Winship Machine Co. (Atlanta, GA), Eagle Cotton Gin Co. (Bridgewater, Mass), and Smith Sons Gin and Machine Co (Birmingham, AL) to become Continental Gin Company, headquartered in Birmingham.
1912	Four-story masonry building added for finished-gin storage.
1926	Woodruff family purchases controlling stock in Continental Gin Company.
1959	Fulton Industries acquires controlling interest in the company.
1962	Prattville facility expanded. Continental Gin Company moves headquarters from Birmingham to Prattville.
1964	Merger of Moss-Gordin and Continental Gin to form Continental/Moss-Gordin Company.
1968	Allied Products Corporation acquires Fulton Industries and their holdings. At the same time, Allied Products acquires Bush Hog Company.
1975	Bush Hog/Continental Gin formed.
1986	Joseph and Roger Fermon purchase 50 percent of Continental Gin Company stock.

Consolidation of Continental Gin Company and Murray division of Murray-Carver, Inc., forming Continental Eagle Corporation.

1988 Joseph and Roger Fermon purchase remaining Continental Eagle Corporation stock to become sole shareholders.

Introduction

During the summer of 1997, the Historic American Engineering Record (HAER) conducted a three-month study of the Continental Eagle Corporation in Prattville, Alabama, a town of 23,000 residents located approximately 12 miles northwest of Montgomery in Autauga County. With buildings dating back to c.1848, Prattville contains some of the few remaining examples of antebellum manufacturing establishments in Alabama. Founded in 1833 by Daniel Pratt, long regarded as Alabama's premier antebellum industrialist, the Daniel Pratt Gin Company (predecessor of Continental Eagle Corporation) became the mainstay of Pratt's industrial village (Prattville) in 1838 when he relocated it from McNeill's Mill to its current location.[2]

The Prattville team studied and delineated the earliest five buildings still in existence, dating from c.1848, c.1852, 1854, 1898, and 1912, focusing on three aspects of the gin factory's nineteenth- and early twentieth-century development -- manufacturing process, power transmission, and factory architecture.[3] Corporate records and operatives' diaries dating back to the 1840s lent insight into contemporary manufacturing processes. The process of gin manufacturing as it occurred on each floor in each building is traced, as well as how processes evolved with factory site expansion, including analyses of machinery, production sequences, and the organization of labor. This is especially important given that scholars have seldom discussed southern manufacturing processes outside the textile industry. As it was, the manufacturing process evolved little through the late nineteenth and into the twentieth century. Multipurpose machine tools eventually replaced handwork, but jobs changed little. Eventually, some special-purpose machinery was

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[2]At mid-nineteenth century, Prattville contained a textile mill, a woolen mill, a foundry, a sash, door, and blind manufactory, grist mills, and various other mercantile and professional enterprises. General accounts of Pratt's life and business can be found in Merrill E. Pratt, *Daniel Pratt: Alabama's First Industrialist* (Birmingham: Birmingham Publishing Co., 1949) (reprinted in Cotton *History Review* 2 [Jan. 1961], 19-29); S.F.H. Tarrant, ed., *Hon. Daniel Pratt: A Biography* (Richmond: Whittet & Shepperson, 1904); Algernon L. Smith, *Continental Gin Company and its Fifty-Two years of Service* (Birmingham: Birmingham Publishing Co., 1952); Curt John Evans, "Daniel Pratt: Yankee Industrialist in the Antebellum South," M.A. thesis, Louisiana State University, 1993; Malcolm C. McMillan, "Daniel Pratt: Ante-bellum Southern Industrialist," unpublished manuscript, Malcolm C. McMillan Papers, Auburn University Archives (also available at Continental Eagle Corporation archives).

[3]See Appendix I, Building Key Plan.

adopted that copied worker's actions. Small-batch production continued through the twentieth century which, coupled with cumbersome multi-story production facilities, militated against mass or assembly-line production.

The plant's power resources evolved piecemeal from the mid-nineteenth to the mid-twentieth century, from water to steam to electric power. Most other studies of industrial power overlook transitional periods of prime movers and in doing so imply a quick and little-negotiated changeover from water to steam, and from steam to electricity. Continental's machinery, however, remained water powered long after the dawning of the "age of steam." And, even when steam was adopted, it was used as auxiliary power; the plant operated from both steam and water for almost fifty years. Further, this steam and water combination continued well into the "age of electricity." However, the reasons behind the delayed transition from water to steam, and from steam to electricity differed. Early inclinations to continue utilizing cheap natural resources -- i.e., water -- likely were born from rational decision-making regarding cost and power needs. That is, having decided to remain in rural surroundings, Continental's leaders ruled against substantial investment in steam power, deciding to adopt it only as an auxiliary source while continuing to use water power. In contrast, the reluctance to invest in electricity and unit-drive machinery was born from corporate aversion to maintaining up-to-date equipment at the Prattville facility, which in the early twentieth century became only one of five Continental Gin Company manufacturing plants, and second to Birmingham's facility in importance. Only with new company ownership and corporate restructuring in the late 1950s, which made Prattville the company's headquarters, did a facility expansion finally push production to all-electric power.

Factory site expansion from c.1848 to 1912 permits a chronological examination of factory building methods through the late nineteenth century. Such an opportunity is rare in the South, given the few remaining antebellum and late nineteenth-century structures and documents. The Continental Eagle buildings, in large part, followed standard New England mill construction methods. With the exception of an unusual roof design in the 1854 building, few innovative methods were adopted. However, construction technologies utilized in the earliest three buildings, c.1848, c.1852, and 1854, lagged behind northeastern construction methods (e.g., slow-burning construction) by about 20 years. With the erection of the 1898 building, design became consistent with that of the North, as was the case with many other southern factories. Likely, the expansion of market and

communications networks after the Civil War encouraged quicker and more thorough dissemination of technological advances.

Taken together, these themes delineate changes in manufacturing process, power, and factory architecture over time, and the reasons behind their evolution. Sometimes these features evolved independently of each other. Other times, changes in one aspect caused change in the others. The decision to remain operating on water and steam, for example, helped maintain artisanal production methods well into the twentieth century by preventing more efficient materials flow. Consequently, this summary lends insight into the interrelatedness of technological diffusion, regional location, industry type, and company leadership in shaping technological style. Further, this project delivers a case study of ante- and post-bellum southern manufacturing that allows comparison with other gin manufacturing companies and industries within the South, and for regional comparison to manufacturing in the North and West.

Background and Site Development

Geographer Charles Aiken, in lamenting the dearth of scholarly work on the cotton gin, summarized well the gin's significance when he wrote: "cotton gins are ubiquitous features on the landscape of the southeastern United States and are pivots in the production of one of the nation's most important agricultural commodities. The gin plant encompasses both the final state of agricultural production and the initial stage of the manufacturing process."[4] Only recently have scholars recognized cotton ginning as an industry. Less often have historians discussed the manufacture of the cotton gin itself.

Gins remove seeds from the cotton fiber.[5] Different machinery developed over centuries to cope with varying grades of cotton, to preserve seeds intact, to maintain fiber length, and the like. The particular need to gin green-seed (short staple) cotton -- easier to grow but harder to gin as the fiber adhered more tightly to the seed than black-seed (long staple) cotton -- encouraged the development of the modern saw gin.[6]

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[4]Charles S. Aiken, "The Evolution of Cotton Ginning in the United States," *Geographical Review* 63 (1973), 196.

[5]See Appendix II, Gin Operation.

[6]"Cotton: A Short History of the Development of the South's Greatest Crop and of the Cotton Ginning Industry," *Cotton Seed Oil Magazine* (1 Feb 1916); Charles A. Bennett, *Saw and Toothed Cotton Ginning Developments* (Dallas: Cotton Ginner's Journal and the Cotton Gin and Oil Mill Press, n.d.); Aiken, 197-99; Malcolm C. McMillan, "The Manufacture of Cotton Gins, 1793-1860,"

Cotton gin manufacturing typified nineteenth-century southern manufacturing. Like grist mills and saw mills, gin producers served the predominantly agricultural region by processing local agricultural products. And, like grist mills and saw mills, the manufactories initially served local markets. Some, like Daniel Pratt, broadened their markets to large portions of the South's black belt. While Pratt started by delivering to planters with horse-pulled wagons, longer distances eventually demanded steamship and rail transportation.

Most pre-Civil War manufacturers were small, usually employing less than ten workers. Daniel Pratt, in contrast, employed 66 hands in 1860.[7] But while the Daniel Pratt Gin Company anchored the industrial town and was the largest producer of cotton gins by the end of the century, it was not a large employer, even by southern standards. In the 1850s, for example, Pratt's company, with approximately 35 hands, paled in comparison with the size of the textile work force: Georgia's Eagle Cotton Mills employed 225, Rowell Cotton Mills employed 350, and Augusta Cotton Mills almost 400. The burgeoning iron industry also dwarfed Pratt's factory. Tennessee's Bellwood Ironworks boasted 215 workers and Tennessee Ironworks 255.[8]

Historically, gin producers ranging in size from small blacksmith shops to 1000 gin-per-year factories have located within their market -- the southern cotton belt.[9] In 1860, there were 57 gin manufacturers in the U.S.; all but three were in the South. As economist William Phillips pointed out, regarding the industry's rural factory locations, "this was an industry quite unlike the geographically concentrated firms of the American manufacturing belt, who not only wanted to locate in cities, but often in the same cities as the other major firms in their

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unpublished manuscript, Malcolm C. McMillan Papers, Auburn University Archives.

[7]Aiken, 196-224; Joseph C.G. Kennedy, "Introduction," U.S. Bureau of the Census, 1860, *8th Census of the United States, Agriculture*, xxvi.

[8]Susanna Delfino, "Antebellum East Tennessee Elites and Industrialization: The Examples of the Iron Industry and Internal Improvements," *East Tennessee Historical Society's Publications* 56-57 (1984-85), 103. See Appendix III for discussion of the nature of the work force.

[9]Important exceptions to this generalization were the Carver Gin Company and the Eagle Cotton Gin Company of Bridgewater, Massachusetts.

sector."[10] He concluded that lack of need for skilled labor militated against gin manufactories locating in cities. But also, as historian Malcolm McMillan has written, gin manufacturers needed close contact with their customers, both for sales and service, and thus they remained amidst planters and yeomen. Even after the turn of the century, Continental Gin Company boasted its easy accessibility to cotton growers: "we are in a better position to extend . . . service than any other manufacturer because we have five plants and three repair depots. Each one is located at a central point in the cotton belt."[11]

Pratt followed cotton planters and cotton production to the western cotton belt when he left Samuel Griswold's Georgia cotton gin manufactory in the early 1830s. Griswold, initially a partner in the new endeavor, later declined to move.[12] Pratt settled on the water power at Elmore's Mill near Wetumpka, Alabama, but soon relocated to McNeil's Mill when rent grew too expensive. Most of the present factory site was purchased in 1835 as Pratt again sought to relocate. A new two-story factory was erected approximately 1839 on the east side of the Autauga Creek, where the Gurney textile mill now stands.[13] The factory was a small portion of the approximately 1800-acre purchase that became the industrial town of Prattville.[14] In 1854, the gin

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[10]William H. Phillips, "Making a Business of It: The Evolution of Southern Cotton Gin Factory, 1831-1890," *Agricultural History* 68 (Spring 1994), 90.

[11]McMillan, "Manufacture of Cotton Gins"; Quote is from Continental Gin Company, "Continental Cotton Ginning Machinery," Catalog no. 143, no date, Continental Eagle Corporation archives.

[12]Samuel Griswold, with his son Elisha, eventually reinvested in the Prattville establishment, from 1850 to 1853.

[13]Shadrack Mims, "History of Prattville," in S.F.H. Tarrant, ed., *Hon. Daniel Pratt: A Biography* (Richmond: Whittet & Shepperson, 1904), 37-38; "Prattville, from Swampy Wilderness to a Thriving Town," *Prattville Progress* (3 April 1896); Daniel Pratt to Walter S. Going, 1 May 1943, Continental Eagle Corporation archives.

[14]Pratt was in partnership in the gin business with Samuel and Simon Ticknor and Amos Smith, gin shop superintendent, for five years commencing 1840. The five-year partnership was renewed in 1845. In 1850, Amos Smith writes, Samuel and Elisha Griswold took over Pratt's interest in the gin company until Samuel requested to sell his interest back to Pratt in 1853. Elisha sold his interest to Shadrack Mims by 1855. See Amos Smith to Dr. S.P. Smith, 4 August 1885, Malcolm C. McMillan Papers, MADD #4582, Box 3, Reel 115, Auburn University Archives. U.S. Bureau of the Census, 1850, *7th Census of the United States, Manufactures* (manuscripts), ADAH, shows the name of the gin company as E.C. Griswold and Co. during those years, but other sources report

manufactory moved to an expanded facility on the west side of the creek.[15] The new masonry building was adjacent to two masonry structures Pratt erected c.1848 and c.1852 and leased to operators of a sash, door, and blind company, a machine shop, and a carpenter's shop.[16] As gin sales increased, the c.1848 and c.1852 buildings were taken over for gin production. A lumber house (including a dry kiln) and foundry were also associated with the gin manufactory. The lumber house sat just west of the manufactory and processed the indigenous yellow pine for use in gin stands. The buildings were connected by an industrial rail line that moved lumber from building to building. The foundry, slightly further west, produced cast iron products used by the factory, including pulleys and fittings necessary for power shafting and belt-driven machinery.[17]

Throughout the nineteenth century, the company diversified its product lines to include other gin-related machinery. In the 1870s, it expanded production to include cotton condensers and feeders, and in the 1880s, elevators and presses. Additionally, in the 1890s, the factory began producing both Munger and Pratt gins for use in the revolutionary Munger gin system. Continued

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the name as S. Griswold & Co. See "Griswold Cotton Gin Manufactory," *Autauga Citizen* (3 Feb 1853); "Gallery of Industry and Enterprise: Daniel Pratt, of Prattville, Ala," *DeBow's Southern and Western Review* (January 1851), 226. Also see correspondence between Pratt and Samuel Griswold regarding the Parkhurst Gin, a conflict over which the two sundered their ties: Pratt Family Collection, Box 196, ADAH. Scattered entries in the diaries of G.L. and F.E. Smith mention difficulties with the Parkhurst gin. See *Journals of Ferdinand Ellis Smith*, Larry W. Nobles, ed., and *Journals of George Littlefield Smith*, Larry W. Nobles, ed., Autauga Heritage Center archives (hereafter referred to as *Journals of F.E. Smith* and *Journals of G.L. Smith*, respectively.

[15]The east-side building was demolished soon after the move to allow modification of the adjacent textile mill's race. Daniel Pratt to E.C. Griswold, 11 March 1856, Pratt Family papers, Box 196, ADAH; *Journals of F.E. Smith*, 7 May 1854.

[16]"Gallery of Industry and Enterprise: Daniel Pratt, of Prattville, Ala." *DeBow's Southern and Western Review* 10 (Jan. 1851), 226.

[17]"A Day with Daniel Pratt at Prattville," *American Cotton Planter and Soil of the South* (May 1857), 156; Daniel Pratt to "sister and brother," 1 June 1847, Pratt Family Papers, Box 196, folder 44, ADAH; "A Peep at Prattville," *Montgomery Daily Mail* (2 August 1857); Henry Ames Blood, *History of Temple, New Hampshire* (Boston: Geo. C. Rand & Avery, 1860), 243; "Prosperity and Progress of Prattville," *Southern Statesman* (24 March 1860). Descriptions of the erection of the 1854 building and lumber house can be found in the *Journals of G.L. Smith*, 19 October 1855.

product diversification and expanding sales necessitated plant expansion. The 1898 masonry building was erected to house heavy metal fabrication as well as assembly of feeders and condensers. At the time of the company's sale to Continental Gin Company one year later, the Daniel Pratt Gin Company was the largest producer of cotton gins in the world.[18]

To support increased gin sales, Continental needed more warehouse space to allow manufacturing throughout the year, rather than slowing or shutting down production for two or three months. In 1912 a finished-product masonry warehouse was built. This allowed storage of finished gins produced in the fall and winter for delivery in June, July, and August. The adjoining Methodist Church was moved to facilitate construction and the intersecting street and bridge were relocated. After this addition, the Continental Gin Company site changed little over the next forty years.[19]

The last major expansion occurred in the late 1950s and early 1960s when Fulton Industries, which had acquired controlling interest in the company in 1959, revamped its multi-state operations. The company consolidated production from Birmingham and Dallas to the Prattville plant, and relocated its executive, sales, and engineering offices from Birmingham to Prattville. A $1.5 million facility expansion, aided both by local financial support and by Alabama's industrial development bond program, accompanied this relocation, which corporate leaders expected would increase manufacturing capacity by 50 percent. Some older buildings, including the lumber house, dry kiln, and even Daniel Pratt's original residence, were destroyed and replaced with a 118,000 square foot steel and masonry facility. This expansion, which included a new office for the corporate headquarters, brought the facility to more than 450,000 square feet of office, plant and warehouses. Additionally, the enlargement allowed operations to move from the multi-level c.1848, c.1852, 1854, and 1898 buildings to a single-floor factory, more conducive to efficient materials transfer and production.[20]

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[18]U.S. Bureau of the Census, 1880, *10th Census of the United States, Manufactures* (manuscripts). See Appendix IV for a breakdown of gin and accessory production over time.

[19]Smith, *Continental Gin Company*, 47.

[20]"World's Oldest Cotton Gin Producer Launches Quarter-Million Expansion," *Birmingham News* 13 January 1957; "Continental Announces $1,500,000 Expansion," *Prattville Progress* (26 October 1961); interview with J. Harvey Clark, 11 August 1997.

19th Century Cotton Gin Manufacturing

Recently, scholars have devoted much attention to the rationalization of production -- the ideal of making the factory a machine in itself. Largely, these studies have focused on how changing power technology allowed engineers to restructure materials handling and to streamline manufacturing. Often identified with Ford and assembly line production, these methods were typically adopted in factories producing large numbers of similar parts. This recent scholarly focus neglects the development of a broad array of factory designs at the end of the nineteenth and early twentieth centuries that incorporated new power and machine technologies to speed up or diversify production. Not all companies sought an ideal of interchangeable parts or assembly-line production. As David Hounshell has pointed out in his seminal study, *From The American System to Mass Production,* interchangeable parts production, central to Fordist production methods, was not actually necessary for large-scale manufacturing or market dominance.[21]

Without assembly lines or mass production, Daniel Pratt led the gin manufacturing industry. The 1880 census takers polled cotton gin users as to their preferred cotton gin, and the Pratt gin garnered the highest returns. Mentioned in 10 states, the gin was the most widely used in the states Pratt intended to market when he moved to south Alabama: Alabama, Mississippi, Tennessee, Arkansas, and Texas.[22] Indeed, Pratt's gins were in high demand and by the 1880s, as the largest producer in the South, he manufactured 1000 gins and related products a year. His was no mass production facility, however.

Rather than a Fordist factory, Pratt's facility more resembled the expanded artisanal shop described by Daniel Nelson: "the contrast between the handicraft shop of 1800 and the factory of 1880 obscures . . . the underlying continuity between them. In most industries the transition 'was so gradual that it is impossible to say precisely when workshop was no longer the appropriate name for the enterprise.'" In textiles the advent of

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[21]Lindy Biggs, *The Rational Factory: Architecture, Technology, and Work in America's Age of Mass Production* (Baltimore: Johns Hopkins University Press, 1996); David A. Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States* (Baltimore: Johns Hopkins University Press, 1984). Also see Daniel Nelson, *Managers and Workers: Origins of the New Factory System in the United States, 1880-1920* (Madison: University of Wisconsin Press, 1975).

[22]Phillips, 87.

the factory brought a distinct break with earlier practices; in other industries "the factory of 1880 remained a congeries of craftsmen's shops rather than an integrated plant."[23]

Through the nineteenth and into the twentieth century, little changed in the method of gin manufacture. Machines gradually replaced hand work to produce these parts, but jobs changed little. Whereas saw teeth were originally hand cut, for example, a machine later cut teeth one by one. A single worker, however, was still assigned to operate the cutting machine and oversee the tedious cutting of each individual tooth. The procedure changed similarly for brush stick manufacturing. While originally assembled by hand-placement and glueing of brushes into hardwood sticks, workers later moved sticks through machines that thrust brushes into bored brush holes. The machines, then, merely mimicked worker actions. The following discussion relays in more detail the gin manufacturing process and labor organization as it occurred in the mid- to late-nineteenth century.

Some of the raw materials necessary for gin manufacture were shipped in from overseas or from Birmingham, but Pratt used what local materials were available.[24] Gin frames consisted of yellow pine harvested from the hills surrounding the factory. While initially harvested from Pratt's own land, timber was later purchased from sawmills in the vicinity. Gin saws were cut from sheets of Naylor & Company's English blister steel. Cast iron gin ribs had to be soft enough to drill and counter-sink for screws, yet hard enough at the gin point to endure great wear. Consequently, ribs were chill-hardened at the point where the cotton is ginned. A type of Scottish iron originally was used for the ribs; later, Shelby Iron Works produced charcoal iron of a suitable grade for gin-rib use. On his use of cast-iron gin ribs, Daniel Pratt summarized for the editor of *DeBow's Review*, "I make use of cast iron ribs altogether -- have been using them more or less for 13 years past, and find them to answer a better purpose than any wrought ribs I have ever used. I think I am the first person that ever made use of cast ribs, I have them chill hardened, nearly as hard as glass where the saws pass through them."[25]

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[23]Nelson, *Managers and Workers*, 3-4.

[24]See Appendix V, Gin Parts.

[25]Daniel Pratt to Editor of Commercial Review, *The Commercial Review of the South and West* (September 1846), 153-54. The Scottish iron came in by ship to Mobile and then was moved up the Alabama river to Washington Landing where it was transferred to wagons for the remainder of the trip to Prattville.

Gin brushes consisted of hog bristles stapled or sewn in to long, bored and shellaced sticks made from hardwoods such as gum. Glue sometimes was used to further adhere brushes to bored holes. In the manufacture of gin brush cylinders, wooden disks were placed on the shaft (generally about 2-3/16 inches in diameter) and slots to hold brush sticks were cut in the disks by machine. Sheet metal sleeves were installed between the wooden disks and brush sticks were nailed securely in the wooden disks' slots. Wire wound around each disk and fastened with staples further secured the sticks. The brush bristles were then trimmed to length, about one inch from the top of the stick. Brush cylinders varied in size depending on the size of the gin stand, but were usually 14 to 18 inches in diameter with the number of brush sticks per cylinder ranging from 22 to 28.[26]

Saws were hammered on twelve- to fourteen-inch anvils both to straighten the saw and to break down the steel's grain structure to increase toughness. A saw hammerer could judge the strength of the saw by intermittently holding up the saw to gauge the amount of flex. Daniel Pratt recalled that "the most skilled man will hammer a saw in not long over a minute. A green hand would take a week and then ruin two or three hundred."[27] The saw's center holes were hand punched or machine drilled, and saw teeth were cut individually, 6 to 16 teeth to the inch. Saws were then placed on a saw cylinder with 3/4-inch saw stops between and "trained" to ensure they ran perfectly perpendicular to the saw cylinder, so as not to hit the ribs (which generally were about one-eighth inch apart). Saw cylinders were then balanced before installation in the gin stand. Gin saws and gin

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Shelby's iron was shipped by rail to Prattville. See District Court of the United States, Northern District of Alabama, Southern Division, Civil Action No. 6128, Deposition of Daniel Pratt, Continental Eagle Corporation archives.

[26]Continental Gin Company, "Cotton Gins and Feeders," Bulletin 116, 8-11, Continental Eagle Corporation archives; interview with Buck Culp, 29 July 1997. By the 1930s, brush cylinder making was so standardized industry wide that a U.S. Department of Agriculture pamphlet read, "in general the manufacturers employ conventional construction developed by years of experience and upon which the patents have expired." United States, Dept. of Agriculture, "Care and Repair of Cotton-Gin Brushes," Circular no. 467 (April 1938), 8-11 (quote is from p. 8). Later brushes sometimes contained horse hair or tampico. Hard maple or beech were also used in later years. Continental Gin Company/Continental Eagle engineering parts specifications A-F948713, XA6949, A-P991275, Continental Eagle Corporation archives.

[27]Deposition of Daniel Pratt, 16-17; interview with Buck Culp, 29 July 1997.

brush rollers then were placed into partially completed yellow-pine gin stands.[28]

The breasting department handled the final assembly of the gin, including installation of saws, ribs, and the last lumber pieces. The department received partially-built gins containing the gin frame with the brush cylinder already installed. Breasting mechanics worked on single gins, or assembled small batches of two or three. They began by preparing the lumber for the batch, including readying of seed boards, box heads, tail pieces, rib boards, and top boards, sawing, dressing, and finishing enough pieces to complete that particular batch. F.E. Smith noted on 27 October 1849, for example, "today at work on our lumber, have got nearly ready to commence breasting."[29] The mechanics occasionally had helpers who assisted with lumber preparation and dressing. Jim, a slave, helped F.E. Smith in the early 1850s. F.E. notes on 6 March 1851, "today left my fronts for Jim to finish and commenced breasting."[30] After lumber preparation, mechanics placed the saws on the saw cylinders and trained them. Ribs were then placed on the gins and final lumber pieces were glued on.[31]

In cases where gin frames were not ready for the breasting mechanics to complete, they prepared lumber for the next gins or did other odd jobs. Gin mechanic F.E. Smith wrote, for example, "this morning went down to the shop to work. Had no gins ready so I went to work on two small lots of fronts, glued them up and dressed out the top boards."[32] They also occasionally had to

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[28]*Ibid;* Daniel Pratt to the Editor of Commercial Review, *Commercial Review of the South and West* (September 1846), 154-54. A 1936 Department of Agriculture pamphlet describes contemporary gin saws as "usually 10 of 12 inches in diameter, the smaller size being used principally in plain gins, whereas huller front gins employ the larger saws. Standard practice is to provide from 235 to 255 teeth per 10-inch and 264 to 282 teeth per 12-inch saw. United States, Dept. of Agriculture, "Care and Maintenance of Cotton-Gin Saws and Ribs," Circular No. 393 (July 1936), 8.

[29]*Journals of F.E. Smith,* 27 Oct 1849.

[30]*Journals of F.E. Smith,* 6 Mar 1851.

[31]George L. And Ferdinand E. Smith worked as gin mechanics for Daniel Pratt. Dates given refer to entries in their journals.

[32]*Journals of F.E. Smith,* 25 Feb 1850.

wait for saws. F.E. noted on 4 June 1851 that they "cannot get saws very fast."[33]

To complete these various parts and assemblies, the company initially maintained a few non-specialized machine tools. From the 1850s to the 1880s these included saw presses, saw filing machines, circular saws, upright saws, cut-off saws, boring machines (or drills), grindstones, emery wheels, iron-turning lathes, tenoning machines, mortising machines, reaming machines, and hand planers.[34] Later, some specialized machine tools were introduced, such as machines that gathered and stapled bristles into bored brush sticks.

Regarding the skill required for these jobs, A.L. Smith, former vice-president of Continental Gin Company, noted, "the hammering of the saws, making the saws, and training the saws required considerable skill and it would take a lot of time to get that skill. The ribbing required skill, but probably not quite as much. Much of the balance of the work a fairly good, skilled machinist that could be picked up in a machine shop could probably do it."[35] Daniel Pratt (nephew of the company's founder) estimated that one-third of the work force was skilled labor.[36]

In 1843, Pratt indicates about 12 people as working in the gin manufactory performing the aforementioned jobs. E.S. Morgan, E.P. Robinson, and William Ormsby were gin finishers, or breasters.[37] They also repaired gins, though Ormsby appears to

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[33]*Journals of F.E. Smith*, 4 June 1851.

[34]Machine tools are described in the *Journals of G.L. Smith*, 23 Jan 1856, 31 Aug 1855, 1 Mar 1855, 24 Feb 1855, 15 Feb 1855, 8 Feb 1855, 3 Feb 1855, 31 Jan 1855, 30 Jan 1855, 8 July 1854, 26 June 1854, 19 June 1854, 16 June 1854, 8 June 1854, 7 June 1854, 2 June 1854, 11 Feb 1854, 9 June 1851, 4 Jan 1851; *Journals of Ferdinand E. Smith*, 18 April 1855, 9 June 1851, 7 June 1851, 5 Feb 1851, 9 Jan 1851, 30 Nov 1850, 8 Jan 1849, 16 Feb 1848; Agreement between F.E. Smith and Daniel Pratt, 1 Jan 1883, Continental Eagle Corporation archives, document no. CEA-1120 (copy also available at the Autauga Heritage Center archives); U.S. Bureau of the Census, 1870, *9th Census of the United States, Wealth and Industry* (manuscripts).

[35]District Court of the United States, Northern District of Alabama, Southern Division, Civil Action No. 6128, Deposition of A.L. Smith, Continental Eagle Corporation archives, p. 143.

[36]Deposition of Daniel Pratt, 17.

[37]On the last day of 1851, F.E. reflected that he had "this year breasted two hundred and thirty eight gins." As Pratt estimated his 1850 production at approximately 500 gins, this likely translates to two or three breasting mechanics working in the shop during the year. The Daniel Pratt time and gin

have done most of the repair work. An 1842 account book describes the jobs and pay arrangements of other employees. Nathan Warleigh was to make 50 improved gin frames at $4.50 each. E.P. Robinson received $3 for breasting 50 saw gins and six cents per saw gin for those over 50, and his board was also paid. Henry Hunt received $133-1/2 per frame. He paid $10/month for his board. W.A. Franks was contracted to make brushes and glue pulleys.[38] F.E. Smith's description of his work arrangement for 1855 depicts a classic subcontracting labor system: "Have concluded the bargain on the job today. Mr. Pratt pays me nine cents per saw and I finish them like the last I made, and I take Charles at six hundred dollars and have him work at breasting, putting on saws and ribs, and I am to have the whole breasting job and the control of the room, and have the materials all got on the floor where I work, and have a grind stone and another cut off saw in the room where I work."[39]

Gin sales, and consequently gin production, ran seasonally. Planters waited until early spring, when they could gauge cotton crop prospects, before buying gins.[40] Deliveries were commonly

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record book (ADAH) contains entries for each gin finished by Morgan, Robinson, and Ormsby. Each new gin is numbered. Gin repairs are noted by the name of the person ordering the repair. Other employees are merely marked for the days or partial days they worked. William Ormsby later is in charge of the machine shop in the 1852 building. In the late 1840s E.S. Morgan established the sash, door, and blind factory in Pratt's 1848 building. E.P. Robinson eventually manufactured horse mills in the 1852 building. See *Journals of G. L. Smith*, 10 December 1855; "The Prosperity and Progress of Prattville," *Southern Statesman* (24 March 1860); advertisement, *Southern Statesman*, 15 December 1850. Morgan may also have built and erected the breast water wheel between the 1848 and 1854 buildings. See the *Journals of G.L. Smith*, 26 January 1855. F.E. Smith took the breasting position when Morgan started operation of the sash, door, and blind factory.

[38]Daniel Pratt account book, 14 Feb 1842, Continental Eagle Corporation archives.

[39]*Journals of F.E. Smith*, 2 Jan 1855

[40]Gins were sold by agents in cities throughout the South. Agents were allowed gins at a discount from list price, and their profit was the difference between the discounted price and the selling price. Pratt advertised having agents in Montgomery and Mobile, Alabama; Vicksburg, Columbus, and Natchez, Mississippi; Memphis, Tennessee; New Orleans, Louisiana; Columbus, Georgia; and Galveston, Texas. See advertisements in *Southern Statesman* (15 December 1860). A.L. Smith noted that "the Pratt gin was very popular and it was no trouble to get a leading hardware firm or implement company at the county seat to take the agency for the gin." See A.L. Smith, "Sixty Years Experience with Cotton Gins," undated manuscript, Continental Eagle Corporation archives. Salesmen who "direct sold" to

made during spring and summer. All planters did not plan ahead, however, as Daniel Pratt observed: "very few [were] foresighted enough to get ready in time and the result is we are in a jam in the spring and early summer."[41] Deliveries in the later part of the year primarily replaced gin house fire losses. Pratt recalled that "we nearly always had some gin house fires and had to replace a great number of those."[42]

The seasonality of production, then, forced the factory to shut down for one to three months, or caused personnel lay-offs. Daniel Pratt said the company did not run year round for two reasons: it did not have enough capital to manufacture and pay the wages, nor did it have finished product storage facilities.[43] The low period of employment was during the winter months. Pratt's assertion is born out by the 1900 Census of Manufactures which shows a high of 275 and 273 people employed in July and August respectively, and a low of 189 in December.[44]

In addition to manufacturing, the factory fixed and started gins. Ferdinand and George Smiths' diaries indicate that gin repairs came heavy during cotton harvesting season, August through December. August, when planters were gearing up for harvest, appeared to be the heaviest month. On 18 August 1855, George Smith noted, "we are busy now repairing old gins." Ten days later he remarked, "at the shop and have been very busy, old gins are coming in quite fast."[45] The Smiths (gin mechanics), Amos Smith (shop superintendent), Daniel Pratt, and various other machinists occasionally traveled to fix gins. Sometimes gin repairs took only one day, other trips were extended. In September, 1855, George Smith noted that "Father and Mr. Pratt

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customers were eventually employed by the company. Until the turn of the century, the company did not spend a great deal on advertising relying on its reputation for high quality gins throughout the South. See Deposition of Daniel Pratt, 13.

[41]Deposition of Daniel Pratt, 84-85.

[42]Deposition of Daniel Pratt, 84-85, 87 (quote is from p. 87); Deposition of A.L. Smith, 164, 165.

[43]Deposition of Daniel Pratt, p. 18.

[44]U.S. Bureau of the Census, 1902, *12th Census of the United States, Manufactures* (manuscripts)(copy obtained from Continental Eagle Corporation archives). The manuscripts indicate the factory operating 10 months and idle 2. The 1870 census indicated the plant operated 12 months, however.

[45]*Journals of G.L. Smith*, 18 Aug. 1855, 28 Aug. 1855.

started this morning out on a tour fixing gins."[46] Around October, mechanics were often out starting gins for patrons, which probably involved adjusting new gins for optimal performance. In October 1851, both George and Amos Smith spent various days traveling locally to start gins.[47]

The factory also sent out repair and replacement parts for Pratt gins. All gins were numbered at time of manufacture and careful record was kept of changes made in gin production. The gin identification number enabled factory mechanics to make and forward correct replacement parts. Daniel Pratt recollected that when gin agent S.I. Munger ordered a replacement brush for a gin, "we would always ask him to give us the gin number and we would get a brush that fit. He laughed at me a good many times and said, 'if we give you the number you make them fit.' I told him we kept our records and knew what we were doing."[48]

Increasing production or changes in power and technology often necessitated factory expansion. While some entrepreneurs had the capital or incentive to adopt best-practice production methods by erecting wholly new facilities, others, like Continental Gin Company, continued to use already established facilities. As the site grew, effective materials handling and efficient production methods were hampered by the constraints of shaft- and belt-power transmission, piecemeal building additions, and multistory structures. Wholesale reorganization of plant operations was not feasible, so plant designers added buildings where space was available and new power sources when needs were greater or different. Consequently, the Continental site displayed a variety of construction techniques and technological advances as manufacturers sought the most economical methods of expanding production, including the use of traditional production methods even as sites expanded and power technology advanced.

The organization of production was determined by the nature of the machinery used, the power supply, and the building technology. Heavy, belt-driven machinery caused significant vibration in timber and masonry factory structures. This, combined with the substantial weight of plant equipment, dictated the placement of most machinery on the lower floors. Production, therefore, moved from the bottom to the top floor. Raw materials

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[46]*Journals of G.L. Smith*, 17 Sept. 1855. The Daniel Pratt time and gin record book (ADAH) (covering the early 1840s), also shows more gin repairs in August.

[47]*Journals of G.L. Smith*, 24 Oct. 1851, 25 Oct. 1851, 28 Oct. 1851, 29 Oct. 1851.

[48]Deposition of Daniel Pratt, 111. Gin record books at the Autauga Heritage Center archives note gin numbers and details of each stand.

processing and parts production, which required significant machinery, occurred on lower floors. Assembly and painting, requiring less machinery, took place on the buildings' second and third floors.[49]

At mid-century, the 1854 building, coupled with the lumber house and foundry, comprised the Daniel Pratt Gin Company. The first floor of the 1854 shop held most of the machinery used to produce the different parts. The breasting and finishing department operated from the second floor, which also included a large room partitioned off for the testing of gins. The third floor housed painting and varnishing. Gin parts, partial and complete gins moved from floor to floor by an elevator likely operated by water power. Gins were moved within each level by rolling them on pipes placed across the floor.[50]

By the 1890s, gin production had outgrown facilities. After leases expired on businesses in the c.1848 and c.1852 building, the Pratts took over the buildings to expand the gin factory, and in 1898 a new building was erected adjacent to the 1854 shop. The 1854 building maintained its original functions of machine shop, assembly, and painting. The c.1848 and c.1852 buildings housed a machine shop, carpenters shop, and sheet metal shop. The 1898 building addition housed wood working, press building, and painting.

At the turn of the century, organization of production within these four buildings resembled that of fifty years earlier. The factory still ran on shafting and belts, so heavy machinery largely remained on the bottom floors. Woodworking equipment initially remained in the c.1848 building and the second floor of the c.1852 building, after removal of the sash, door, and blind company. Other floor uses changed. Sheet-metal fabrication eventually moved to the 1852 building, for example, as did some space-demanding foundry work, such as power shaft finishing. However, small-batch production and belt- and shaft-

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[49]Regarding structure vibration and equipment organization, also see Betsy W. Bahr, "New England Mill Engineering: Rationalization and Reform in Textile Mill Design, 1790 - 1920," Ph.D. dissertation, University of Delaware, 1987, 45.

[50]"A Day with Daniel Pratt, at Prattville," *American Cotton Planter and Soil of the South* (May 1857), 156; interview with Buck Culp, 29 July 1997. Various Continental Gin Company engineering maps show floor operations (Continental Eagle Corporation archives). Also see Sanborn Fire Insurance Maps, Montgomery, Alabama, Sanborn Map and Publishing Company, 1884, 1888, 1894, 1900. Sanborn maps are available at the University of Alabama library and the Autauga Heritage Center archives. Thanks to Lenore Kirkpatrick and Mary Ann Neeley for locating these elusive sources.

utilizing power continued to dictate against streamlined production; individual parts were produced in various buildings and then piled in or near assembly areas until needed.[51]

Into the twentieth century, manufacturing began moving from the older, more narrow c.1848 and c.1852 buildings to become more concentrated in the 1854 and 1898 buildings. The older two buildings increasingly served as parts and pattern storage, as well as office and storage for the company's repair sales division. Not until the erection of the single-story 1962 building did production move from the 1854 and 1898 buildings.

Power

Louis Hunter, in his seminal collection of volumes, *A History of Industrial Power in the United States*, correctly points out that "industrialization did not await the general introduction of steam power in the manufacturing industries."[52] Indeed, antebellum manufacturing was founded on horse, hand and water power. Industries that characterized the transition from an agricultural economy to urbanized industrialism -- grist and saw mills, blacksmith shops, and the like -- did not initially benefit from the availability of steam.

Moreover, the transition to steam power was neither quick nor pervasive. As Hunter makes clear, "the primacy of waterpower during the early stages of American industrialization is an important fact in the history of Western technology, refuting the widespread assumption that steam power reduced waterpower to obsolescence."[53] Though the use of water power relative to steam

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[51]See Appendix VI for a time line of manufacturing operations and locations.

[52]Louis C. Hunter, *Waterpower in the Century of the Steam Engine*, Volume 1, A History of Industrial Power in the United States, 1780-1930 (Charlottesville: University Press of Virginia, 1979), 539.

[53]Hunter, *Waterpower*, 539-40. To be sure, steam usage grew with expanding post-Civil War industrialization of the U.S., as the increasing urbanization of industry necessitated the wider use of steam. In 1820, for example, water wheels likely outnumbered steam engines by more than 100 to 1. By 1900, though, steam engines outnumbered water power sources by almost 4 to 1. In the South, in 1840, only about 10 percent of plants had adopted steam. By 1880 the percentage reached 70, and by 1900 almost 80. No longer were industries constrained by the need to locate on available water supplies, and some sought locations that optimized resource and transportation accessibility. Significantly, the aforementioned percentages include plants using steam as auxiliary power or as the sole power source. Consequently, it is unclear how many factories used multiple power sources and for how long. See Atack, 181.

declined over time, water-powered production expanded in absolute terms through the turn of the century, indicating a continued reliance on water in some areas. The Lowell mills continued utilizing water power into the twentieth century. In 1911, for example, the Boott Mills complex produced three-eighths of its power by water, the balance by steam. As industrial historian Betsy Bahr summarizes, this multiple power use "represented a continued belief in the practical utility and development potential of a traditional water power site."[54]

Others, too, have questioned the primacy of steam power. Historian Peter Temin argues that steam power was widely adopted in manufacturing by 1840, but it was concentrated in a few industries and provided the main power supply for almost none. That same year, the direct costs of steam power were higher than water power. Consequently, factories introduced steam only when the gains offered by freedom of location were large. Jeremy Atack, Fred Bateman, and Thomas Weiss also questioned the quick penetration of steam in the nineteenth century and sought to explicate its diffusion rate and its regional variations. Regarding the South, they tentatively asserted that the high cost of using water power in the region promoted a more rapid diffusion of steam when compared to other areas.[55]

These studies reveal the broad parameters of nineteenth-century power change, but they provide little insight into the use of multiple power sources as new technologies spread through industries or regions. Most acknowledge the use of steam, for example, as an auxiliary power source to water, but they fail to fully investigate the extent or nature of multiple power source use. Closer analysis of those companies already vested in water powers may reveal that there was a wider array of responses to new steam technology. It is important, then, for scholars to examine the extended use of water power, and too, how and when industries approached the transition to steam. Significantly, these issues are revisited in the later transition to electric power.

Continental Gin Company (in all of its manifestations) spent one-third of its 164 years on multiple power supplies, and at mid-twentieth century, actually utilized water, steam, and electric power. From the early 1830s, when Daniel Pratt first

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[54]Bahr, 215.

[55]Peter Temin, "Steam and Waterpower in the Early Nineteenth Century," *Journal of Economic History* 26 (June 1966), 187-205; Jeremy Atack, Fred Bateman, and Thomas Weiss, "The Regional Diffusion and Adoption of the Steam Engine in American Manufacturing," *Journal of Economic History* 40 (June 1980), 281-308.

sought an Alabama location for a gin manufactory, adequate water power was his chief concern. Pratt built his first gins in 1833 using the water power at Elmore's Mill, about sixty miles from Wetumpka. The next year he leased the water power at McNeil's Mill. In the late 1830s, after purchasing almost 2000 acres at the present site, Pratt moved his gin manufactory to a two-story building on the east side of Autauga Creek. Here, the manufactory was run from water power, though sources do not indicate the type of wheel used or the horse power involved.[56]

From 1854, when the factory was moved to the creek's west side, until the 1870s, the gin manufactory operated on power generated by a single breast wheel located between the c.1848 sash, door, and blind factory and the 1854 building. The wheel provided about 66 horse power. A 14-inch leather belt ran from the wheel machinery into the first floor of the 1854 building, which then coupled to shafting on the first floor of the 1848 sash, door, and blind factory. In each building power was transmitted to shafting on the second and third floors by leather belts moving through openings in the ceilings. Iron pulleys, cast in the company's foundry, and leather belts transferred power from the shafts to individual machines. Additionally, the water wheel provided power to an elevator in the c.1852 building. Leather belting from the first-floor shafting passed through holes in the floor to power the elevator drive machinery located in the basement. An elevator in the 1854 building may also have operated from the water-powered shafting before running on its own steam engine.[57]

In the mid-1850s, many manufacturers were taking advantage of steam power and moving to cities, where they could enjoy better transportation networks and economies of scale. Pratt, like his contemporaries, recognized the importance of economies

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[56]Mims, in Tarrant, 21; Daniel Pratt to Walter S. Going, 1 May 1943, Pratt Family Papers, Box 196, Folder 48, ADAH; U.S. Bureau of the Census, 1850, *7th Census of the United States, Manufactures* (manuscripts), ADAH. The original dam, likely built in the late 1840s, was brick laid in cement. It measured 150 feet long, 12 or 15 feet high, 18 feet wide at the base and 3 feet wide at the top. U.S. Bureau of the Census, *Report on the Waterpower of the Eastern Gulf Slope* (1883), 5. The report notes several under-utilized water privileges in Autauga County.

[57]Daniel Pratt to [?] Chandler, 19 July 1854, Pratt Family Papers, Box 196, unnumbered folder, ADAH; U.S. Bureau of the Census, 1870, *9th Census of the United States, Wealth and Industry* (manuscripts), ADAH; "A Day with Daniel Pratt, at Prattville," *American Cotton Planter and Soil of the South* (May 1857), 156. The elevator, manufactured by Lane and Bodley of Cincinnati, Ohio, and its drive machinery, remain intact in the building basement.

of scale, transportation, and urbanization. But, well-situated in his market with adequate access to some of his raw materials (like yellow pine), Pratt sought to diversify Prattville's economy and develop its transportation networks rather than adopting steam power and relocating. In pursuit of this goal, he espoused the virtues of industrial urbanization in his attempts to attract railroad interests. In a letter to the *Southern Statesman* Pratt asserted "any person who has had much experience in manufacturing will agree with me when I say it requires concentration of machinery and capital to make manufacturing profitable, and that capital and machinery will concentrate where the greatest facilities are found. There are three things to be considered to ensure success: first health; second, motive power; third, accessibility to market. The two first we have; the third we shall have if we can succeed in building our railroads."[58] To facilitate transportation he built a plank road to Washington Landing where gins were loaded on steam ships for delivery (one ship was appropriately christened the *Daniel Pratt*). By the end of the 1870s, Pratt's proselytizing on the need for railroads came to fruition when the Louisville and Nashville railroad completed its line through Prattville. Situated on suitable power, amidst ample yellow pine for gin stands, near Alabama river steam ships to deliver gins, and now with rails to bring iron or deliver gins, Pratt had little need to relocate or to switch power sources.[59]

Moreover, during these years, turbine manufacturers developed new technology that offered water-powered manufacturers a choice. From 1869 to 1909 industrial water-power capacity increased nationally by 61 percent. Part of the reason for water power's continued significance was the introduction and widespread use of water turbines. Increasing numbers of

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[58]*Southern Statesmen*, 26 May 1855.

[59]Randall M. Miller, "Daniel Pratt's Industrial Urbanism: The Cotton Mill Town in Antebellum Alabama," *Alabama Historical Quarterly* (Spring 1972), 5-35. Various account books held at the Continental Eagle Corporation archives detail gin shipments, including dates and names of steam boats used. Pratt also used wagons to deliver gins to more local destinations, which is also indicated in account books. Pratt purchased Washington Landing in 1850, at which time he constructed a warehouse. For discussion of the purchase see Curt John Evans, "Daniel Pratt: Yankee Industrialist in the Antebellum South," M.A. thesis, Louisiana State University, 1993, 58-59; Willis Brewer, *Alabama: Her History, Resources, War Record, and Public Men, from 1540 to 1872* (Spartanburg, SC: The Reprint Co., 1975), 108. Thanks to Larry Nobles for pointing this source out.

manufacturers, competing with old-style wheels as well as steam power, produced cheap, reliable, and efficient turbines. As Hunter notes, "although turbine builders did no more than retard the shift from direct-use waterpower to steam power, they scored a striking success in supplying establishments depending on waterpower with efficient wheels at low cost."[60] Additionally, the difficulties and expense of moving to a new site or providing an auxiliary steam plant made improved water wheels a welcome alternative. Already vested in water power, Pratt and others utilized water turbine technology rather than changing to or adding steam.[61]

In the 1870s the Pratts replaced the breast wheel located between the c.1848 and 1854 buildings with a 4-foot diameter Eclipse water turbine, manufactured by the Stillwell and Bierce company of Dayton, Ohio. The turbine wheel increased the factory's power from 66 to 88 horsepower, and by 1900 it delivered 100 horsepower.[62]

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[60]Hunter, Vol. 1, 353.

[61]Hunter, Vol. 1, 522.

[62]U.S. Patent Office, "Improvement in Water-Wheels," Jacob O. Joyce, Patent No. 75,765, 24 March 1868. Joyce claimed that the two tiers of graduated buckets alternate in position so that one or the other set of buckets is constantly presented to the water inlet openings, thus the action of the wheel is materially improved, as one or the other set of buckets is in contact with the water inflow at all times. Additionally, the interior of the wheel is conical so as to enlarge the discharge-space (from top to bottom), thus allowing the water to freely escape after is has left the buckets. Also see U.S. Patent Office, "Improvement in Cases for Turbine Water Wheels," Jacob O. Joyce, Patent No. 105,808, 26 July 1870. U.S. Bureau of the Census, 1880, *10th Census of the United States, Manufactures* (manuscripts), ADAH; U.S. Bureau of the Census, 1902, *12th Census of the United States, Manufactures* (copy obtained from Continental Eagle Corporation records). This change did not affect the power transmission design within the buildings, but necessitated some change to the infrastructure of the wheel pit itself. The nature and extent of the changes is unknown. Discussion of the new technology and turbine types can be found in Hunter, Vol. 1, 292-415; *Appleton's Cyclopaedia of Applied Mechanics* (N.Y., D. Appleton, 1885-86), 916-25; Robert A. Howard, "A Primer on Water Turbines," *American Preservation Technology* 4 (1976), 45-63. Information about infrastructure change necessary to adopt turbines in a previously-erected wheel pit was obtained from an interview with Robert A. Howard, 23 June 1997. Past Continental Eagle Corporation employees helped the team reconstruct the workings of the wheel pit, including Jake Graves, Woodrow Johnson, Emmett Price, Alton Anderson, and Vernon Williams.

The draft tube remains from the turbine infrastructure, but the turbine itself was scrapped in the 1980s. The tub was then modified (including removal of penstock or flume) for use as a water retention tank for a machine cooling system. The head race also has since been filled in, though the trash

Once production needs exceeded the c.1848, c.1852, and 1854 buildings' size, and once power needs exceeded the turbine's capability, new facilities were erected and steam power was adopted. That is, as was often the case in established water-powered factories, steam was adopted as an auxiliary power source; it served as the primary power for the newly-erected 1898 building. A 150-horse power Atlas Corliss steam engine with two 66-inch boilers was installed with the erection of the 1898 building and sat adjacent to the building's western exterior. A large fly wheel ran a leather belt through a hole in the masonry to shafting on the first floor. A leather belt then transmitted power from the first-floor shaft through belt holes in the ceiling to the second-floor shaft.[63]

The steam engine also served as auxiliary power (and eventually primary power) for the 1854 building. The 1898 facility lay adjacent to the 1854 structure (most of the interceding wall being eliminated), and factory engineers installed a coupling between shafting of the two buildings. The 1854 building, therefore, could run from steam power or water power. The machinery in the older buildings on the site, c.1848 and c.1852, remained on water power. At the turn of the century, then, the Continental Gin Company facilities operated on belts and shafts alternately driven by either steam or water power. The plant continued to operate on both supplies until the mid-1940s -- a transitional period of almost fifty years.[64]

As the Daniel Pratt Gin Company installed its Atlas Corliss, engineers and industrialists debated the advantages and disadvantages of electrically-powering factories. While adoption

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rack and control gates are still visible from the inside of the tub. Two of the original tail races remain open. Two others were likely filled in when the infrastructure was modified for the turbine wheel.

[63]Daniel Pratt Gin Company accounts payable books, 31 October 1899, shows the purchase of the 150-h.p. steam engine from Atlas Engine Works for $1213.03 (Continental Eagle Corporation archives); U.S. Bureau of the Census, 1902, *12th Census of the United States, Manufactures* (manuscripts) (copy of census manuscript obtained at Continental Eagle Corporation archives); interview with Alton Anderson 1 July 1997; interview with Buck Culp, 15 July 1997. Various plant plans and fire maps show the location of the steam engine, as well as the entering belt hole. Plant plans from various years are available in the Continental Eagle Corporation records; Sanborn Fire Insurance maps for the years 1884, 1886, 1894, and 1900 are available from University of Alabama and the Autauga Heritage Center archives.

[64]Interview with Alton Anderson 1 July 1997; Interview with Buck Culp, 15 July 1997.

of electricity was hampered by its high cost in the last decade of the nineteenth century, the spread of electric utilities soon brought prices down. Initially, electric generators substituted for steam engines; belts, pulleys, and shafts remained intact. This system continued large friction losses and the necessity of turning all the shafting in the plant regardless of the number of machines operating. Group drive -- the installation of motors to drive small groups of machines -- allowed engineers to stop sections of machinery when not in use, thus cutting energy usage in factories that, due to the structure of belting and shafting, previously had to operate entire buildings of machinery at once. This energy savings enhanced the change to unit-drive electricity. Additionally, engineers argued, unit drive eased the shifting of tools from place to place, alleviated oil drip from overhead shafting, allowed non-parallel placement of machinery, and permitted a wider range of machine speeds.[65]

Daniel Nelson notes that in addition to high initial costs, the often negligible advantages of using electricity to power factories designed for water or steam power and shafting hindered electricity's adoption. Such factories often used steady amounts of power throughout the day, and thus did not accrue much benefit from group- or unit-drive machinery. Indeed, many industries, particularly textiles, deemed their steam or water power sufficient and delayed adoption of initially-expensive electrical power.[66]

Walter Devine concurs with Nelson and questions the widespread use of unit-drive machinery in the earliest years of the twentieth century, contending that unit drive did not become the predominant form of electric drive until after World War I. Noting that scholars used contemporary technical literature to argue electricity's quick dissemination, Devine reminds historians that technical meetings and journals "have always been forums for discussion of new concepts and developments" and "those who advocated unit drive were probably well ahead of established practice."[67] Machine tools designed specifically for unit drive were probably not in wide use until after World War I,

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[65]Warren D. Devine, Jr., "From Shafts to Wires: Historical Perspective on Electrification," *Journal of Economic History* 43 (June 1983), 347; F.B. Crocker, V.M. Benedikt, and A.F. Ormsbee, "Electric Power in Factories and Mills" *Transactions of the American Institute of Electrical Engineers* (26 June 1895), 404.

[66]Nelson, *Managers and Workers*, 22; Bahr, 216; Biggs, 85-87.

[67]Devine, 368.

and additionally, electric utilities were not widespread until the 1920s. Likely then, unit-drive likely did not pervade manufacturing until the 1920s.

The Pratt facility continued to operate on water and steam long after electricity spread through manufacturing, even lagging other southern industries. Manufacturing eventually became the largest electricity-using sector in the economy and in 1929 electric motors represented about 78 percent of total capacity for driving machinery. Many southern textile mills hydroelectrically powered machinery, but only in newly erected buildings. The Muscogee Manufacturing Company (Columbus, Georgia) used steam and turbine power in its 1880 and 1886 mills. Its 1904 mill, in contrast, employed hydroelectric power. By way of contrast, Continental Gin Company began utilizing electric power only sometime between 1932 and 1945, and then as group drive. New machinery, added gradually, employed unit drive, but it was a slow transition until the 1960s.[68]

Management priorities kept the Prattville plant behind in electric power technology. One of three manufacturing sites under Continental Gin Company (with Birmingham as the headquarters), Prattville eventually became more or less a satellite shop. Consequently, the plant enjoyed little priority for upgrading of power or machinery. And, too, in the 1950s, it became clear that Continental soon would have to rework its manufacturing design. Birmingham did not have enough business to keep it running, and management considered relocating operations to either Dallas or Prattville. With change imminent, corporate leaders hesitated to invest further in the Prattville factory until final decisions were made. Once Fulton Industries purchased and reorganized Continental Gin Company, the headquarters were relocated to Prattville. The company then began upgrading power and machinery. By 1962 the plant was run

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[68]Richard B. DuBoff, "The Introduction of Electric Power in American Manufacturing," *Economic History Review* 20 (1967), 510; Nelson, *Managers and Workers*, 18, 22; Lindy Biggs, *The Rational Factory*, 85-87; Devine, 349; Bahr, 229; interview with Buck Culp, 15 July 1997. A shaft-driving motor remains on the second floor of the 1898 building. Lights, powered by steam-generated electricity, were added sometime between 1900 and 1911. A 1911 plant map indicates power fuel as coal, other maps indicate coal and shavings. Copies of all maps are in possession of Continental Eagle Corporation archives. Copies of the 19th-century Sanborn maps are available from the University of Alabama and the Autauga Heritage Center archives.

entirely by electricity and the steam engine was removed from the site.[69]

Continental Eagle, since its inception as the Daniel Pratt Gin Company, operated for more than one-third of its years on multiple power supplies. A 1945 site map indicates that, at that time, plant operations ran 50% on electricity, 30% on steam, 15% on water power, and 5% on steam-generated electric transmission. After running on a mix of water and steam for forty years, the plant continued on water, steam, and electricity for about 15 years. Water power use ceased around 1945, and the plant continued using steam and electricity until the company began large-scale restructuring of the facility in the late 1950s.

Significant differences marked the transition to steam and the transition to electricity, however. Early, extended use of water power, and the later combination of water and steam, drew from decisions regarding effective resource use with consideration to cost and power needs. Later, lack of priority given the Prattville plant, and eventually its potential closure, militated against adoption of state-of-the-art electric power and unit-drive machinery.

Factory Design

By the time Pratt began erecting his c.1848 building, factory and mill building standards were finding wider audience. New England mill architects, borrowing and modifying English designs, adapted vernacular building techniques to the needs of industrial production by mid-nineteenth century. With the growth of manufacturing, effective mill and factory engineering became better recognized as significantly adding to production flow, and designs incorporated new ideas about fire protection -- no small concern in burgeoning textile mills.

Most new mill design was developed by those directing the industrially dominant textile industry. The Boston Associates, for example, invested substantial capital into the growing textile centers of Waltham and Lowell, Massachusetts, while introducing rationalized textile mill designs that became factory standard.

Other industries borrowed these architectural forms. Some construction techniques spread by way of designers or builders who carried ideas from project to project. Other times, factory and mill owners visited different sites to garner information on alternative designs. Furthermore, construction and layout techniques became principal topics of discussion in technical

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[69]"Analysis of Continental Gin Company," 16 August 1957, Continental Eagle Corporation archives; interview with J. Harvey Clark, 11 August 1997.

journals. Through these modes of transfer, industrial architecture forms passed from region to region and industry to industry. Given the varied process of diffusion, it is not surprising that particular regions or industries adopted building technologies at varying rates. Some embraced new technology quickly but modified it for local conditions. Others adopted technologies *in toto* but at far slower rates. Such was the case at Continental Gin Company. Designers of Prattville's original facilities mimicked New England building methods; however, those methods were already dated, having been supplanted by new standards 20 years earlier. The company, moreover, maintained these outmoded design arrangements for decades.

Industrial historian Betsy Bahr describes three stages in nineteenth-century mill-building development. First, in the early 1800s, northeastern mill and factory builders typically relied on nearby -- and cheap -- timber supplies. Timber beams were normally 8-feet on center with joists and thin board flooring. By the turn of the century, this type of construction became know as "ordinary construction" to differentiate it from "slow-burning construction" methods (to be discussed). But, by 1830, stone and brick replaced wood in wall construction. Early masonry mills incorporated load-bearing exterior walls with an interior wood system.[70]

In the second stage, after 1825, mill engineers began developing slow-burning construction methods. Initially, slow-burning construction (sometimes termed "mill construction") comprised heavy structural flooring, made of 3 inch thick planks, and transverse timber beams, 14 inches by 12 inches thick. Timber beams were placed 5 feet on center. The term "slow-burning" described the design's fire-resistant properties; thick floors and beams charred rather than burned rapidly. In later years, the National Board of Fire Underwriters set down specific guidelines for buildings described as "mill construction": columns, 8 inches with rounded or chamfered corners; beams and girders 6 inches in either direction; floors, 3 inches thick and 1 inch finish flooring; roofs, 2-1/2 inches thick, and wood partitions, 2 inches thick. While the terms "slow-burning" and "mill" construction were often used interchangeably, the National

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[70]Betsy W. Bahr, "New England Mill Engineering: Rationalization and Reform in Textile Mill Design, 1790 - 1920," Ph.D. dissertation, University of Delaware, 1987; Gary Kulik, "A Factory System of Wood: Cultural and Technological Change in the Building of the First Cotton Mills," in Brooke Hindle, ed., *Material Culture of the Wooden Age* (Tarrytown, NY: Sleepy Hollow Press, 1981), 41-42; Whitney Clark Huntington, *Building Construction: Types of Construction, Materials, and Cost Estimating* (N.Y.: John Wiley & Sons, 1929), 6.

Fire Protection Agency recommended the more specific term, "slow-burning, heavy timber construction."[71]

Various New England building sites demonstrate the transformation from joisted flooring to slow-burning construction. The Woonsocket Mill's 1822 portion was joisted, the 1826 addition was not. Similarly, the 1825 Crown Mill at Exbridge, Massachusetts, employed floorboards and joists; the adjacent Eagle Mill built between 1827 and 1830 used thick plank wooden floors and beams. Heavy wooden floors and timber beams were common among the larger New England textile factories by 1840.[72]

The third stage combined fire-retarding technologies with growing structural engineering knowledge to produce wider, three- to four-story buildings with larger windows and higher ceilings. Such structures characterized New England factories built after 1850. Typically measuring from 62 feet to about 74 feet in width, these newer structures introduced pilaster construction, which consisted of thick brick piers that buttressed the strength of the building between large window openings. As Bahr summarizes, "these modifications met manufacturers' growing demands for larger interior spaces and made use of more efficient power generation and transmission technologies."[73] By the 1880s, such techniques were becoming widely accepted and utilized in the Northeast.

Prattville's construction did not keep pace with textile mill construction techniques in the Northeast. If Prattville designers had practiced state-of-the-art northeastern technologies, it is likely that the three earliest structures -- the c.1848, c.1852, and c.1854 buildings -- would have employed slow-burning construction techniques. Rather, these buildings

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[71]Bahr notes that recent evidence suggests that structural changes in northeastern factories were valued initially for structural stability rather than for their fire-resistant qualities. See Bahr, 26-27. Richard Candee argues that New England mill builders modified British methods to local materials, which economizing cost. That is, English fire-proofing techniques were adopted while utilizing wooden posts and timber beams used with heavy plank flooring -- as Bahr puts it, "a vernacular interpretation of new technical information and structural ideas." See Bahr, 25. G. Underwood describes slow-burning construction more generally as "designed with timber columns and girders of large cross-section and with floors made of heavy plank laid directly upon girders." G. Underwood, *Standard Construction Methods* (N.Y.: McGraw-Hill, 1931), 174; Huntington, 6.

[72]Bahr, 26.

[73]Bahr, 66.

utilized joisted floor (ordinary) construction until the erection of the 1898 building. The c.1848, c.1852, and 1854 buildings all contained joisted floor construction consisting of two layers of tongue and groove construction (2-1/4 inches thickness total) with the top layer on the diagonal. While considered ordinary construction, these structures did include some fire-retarding building techniques, but not the principle standards associated with slow-burning construction. Pillars were chamfered for example, and stairwells, while not external to the building, were enclosed to prevent fire from spreading easily from floor to floor.[74]

Belting and shafting necessitated long, narrow structures for efficiency. The site's earliest buildings, c.1848 and c.1852, were traditional multi-story, narrow structures. Narrow buildings brought windows close to the ends of the machinery for natural lighting. The 1854 building was wider (50 feet as opposed to 29 feet), but still narrow compared to textile mills of the era.[75]

While Pratt's building techniques may have lagged the Northeast's, they were standard construction practices, with one exception. The 1854 building contained an innovative truss design suspending the third-level ceiling/attic, thereby eliminating columns normally required for support. The editor of *American Cotton Planter and Soil of the South* remarked that "the third floor is all in one room -- probably the largest in the state -- 250 by 50 feet."[76]

Bahr fails to broach early- or mid-nineteenth century southern textile mill standards. She does note, however, that from the late nineteenth century through the early 1900s, southern cotton mill building outpaced northern expansion and southern cotton factories built during this period incorporated modern mill engineering and construction standards. The mills contained wide interior spaces, which facilitated continuous process flow. Most factories were wide, three- and four-story single structures, though medium sized mills were sometimes only two stories tall. Between 1895 and 1910, factories measuring up to 125 feet by 360 feet were common in southern mill design. The

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[74]See Appendix VII for an outline of the site's construction techniques.

[75]Bahr, 13.

[76]"A Day with Daniel Pratt, at Prattville," *American Cotton Planter and Soil of the South* (May, 1857), 156. The isometric section of the 1854 building, in the project's associated architectural drawings, delineates the features of this structure.

Arista Cotton Mill, completed in 1880, measured 72 feet by 267 feet. The Columbus Manufacturing Company's original 1901 mill, measuring 120 feet by 300 feet, featured large windows, brick pier walls, and a nearly flat roof. In 1910 the owners extended the original mill by 240 feet; the large acreage surrounding the factory afforded ample room for linear expansion without sacrificing a rational process flow.[77]

Like the late nineteenth century southern cotton mills, Continental Gin Company's 1898 and 1912 buildings employed modern building techniques. Heavy thick flooring eliminated joisted floors. The 1898 building's second level flooring is 6 inches deep and the third level, 4-3/4 inches. The top layer runs diagonally. Similarly, the 1912 building is built without joists, its flooring in two layers of 2-1/2 inch total thickness, the top layer on a diagonal. (Since the 1912 building was designed as a warehouse and not to run heavy, vibrating machinery, it is not surprising that the lower floor is thinner.) Both buildings utilized brick piers, the 1898 on the interior and exterior, and the 1912 on the exterior. Both buildings employed iron post caps and bases at column and beam junctions, eventually considered a standard feature of mill construction. The column end of beams was supported on the post caps, which permitted the column of the story above to pass the end of the beams. In the earlier buildings posts bore directly onto beams, a technique later advised against as column shrinkage could cause timbers to sag.[78]

Designing mills with flat rather than pitched roofs also became a standard feature of mill construction in the latter nineteenth century.[79] The progression of decreasing pitch is clear on each Prattville building. The c.1848 and c.1852 buildings have 35° pitches, the 1854 a 25° pitch, the 1898 a 15° pitch, and the 1912 a 9° pitch.

Slow-burning construction guidelines demanded large columns, but all of the site's buildings that utilized columns met minimum standards. Column sizes ranged from 9-1/4 inches square on the c.1848 building, to 14 inches square on the 1898 building. The c.1848 and c.1852 buildings used the same column sizes on each floor. Later buildings use smaller columns on the upper floors, in recognition that those floors carried lighter loads. Columns

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[77]Bahr, 223, 228-29.

[78]George A. Hool and Nathan C. Johnson, eds., *Handbook and Building Construction* (N.Y.: McGraw-Hill, 1920), 388; Huntington, 267.

[79]Bahr, 269.

in all buildings were chamfered with the exception of those in the 1912 building. This is consistent with other features: that is, this building did not utilize all slow-burning construction techniques, as lack of production activities gave fewer opportunities for fire and sprinkler systems were likely considered adequate protection.

Bahr's lack of comparison of early- to mid-nineteenth century northern and southern mill construction methods reflects the paucity of scholarship on southern factory architecture. Given Prattville's mid-nineteenth century technological lag, it may be that many southern factories' building techniques trailed the Northeast's. After the Civil War -- as markets, industrialization, and communication networks expanded -- the South apparently caught up in its building technology, lending credence to Bahr's assertion that (late nineteenth century) southern builders employed modern methods.[80]

Conclusion

Continental Gin Company's late nineteenth and early twentieth century experience counters many assumptions regarding industrialization and forces some modification of accepted historical arguments. The company's machine-shop production methods, like examples from David Hounshell's *From the American System to Mass Production*, challenge the supposition that manufacturing immediately or thoroughly adopted interchangeable parts and assembly-line production. Instead, factories similar to those in Prattville -- producing small batches with hand-finished parts -- persisted and, like Continental Gin Company, even lead their industries.

Similarly, this study adds to recent scholarship challenging notions of quick and pervasive diffusion of steam and electric power throughout manufacturing. Previous generalizations regarding power diffusion overlook transitional stages between changing paradigms and hinder understanding of how various companies or industries dealt with new technological choices. Continental Gin Company, like the Lowell Mills, continued to use water power as long as feasible, even after steam pervaded urban areas. The advent of low-cost water turbines, coupled with auxiliary steam power, allowed Continental to maximize use of local water power. In other words, the decision to remain on water power was an effort to maximize the use of local resources.

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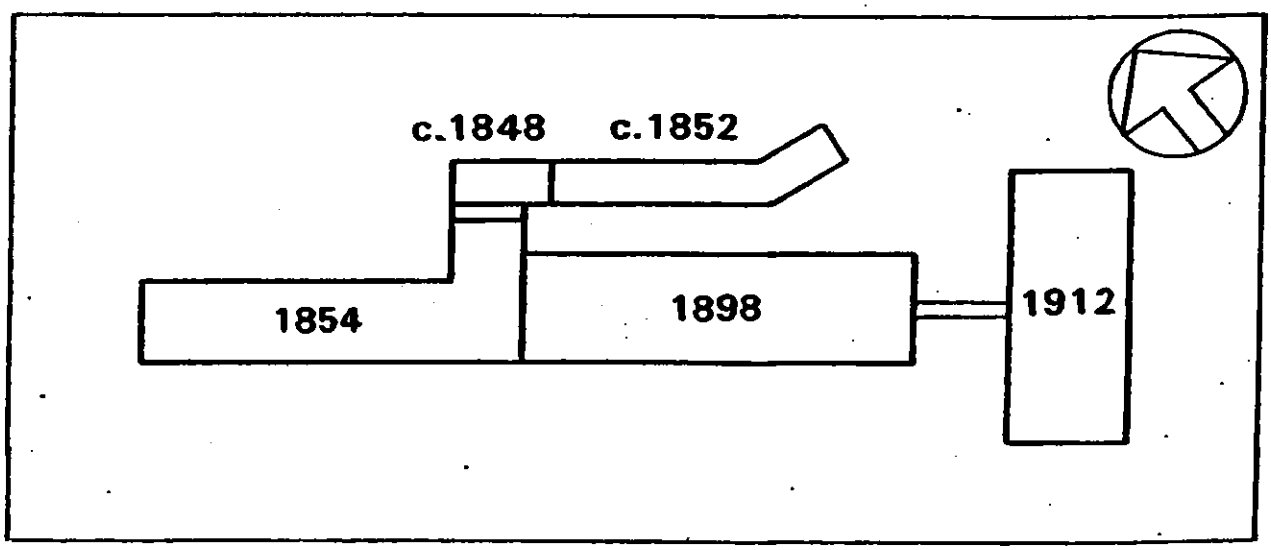
[80]The 1854 building contract includes discussion of floor and building size and wall thickness, but little other essential features are delineated. Daniel Pratt contract with A.I. Muler, Hiram Granger, and T.B. Goldsby, 28 September 1853, Continental Eagle Corporation archives.

In contrast, the company's extended use of water and steam power through the mid-twentieth century, when availability of cheap electricity would have allowed for streamlined production and a safer factory, resulted in part from management's unwillingness to invest in Prattville plant expansion. Corporate leadership delayed adoption of electric power to avoid significant capital expenditure in the company's secondary facility -- one that by mid-century faced closure.

Little work has systematically analyzed factory and mill design in the South. Consequently, this project is an early foray detailing antebellum southern factory architecture that will have to wait comparison with other contemporary mills and factories. However, we venture some assertions on the diffusion of building methods. Various scholars have detailed the South's borrowing of northern technology. Consequently, it is not surprising to find New England building methods adopted in Prattville and elsewhere. Similarly, scholarship has demonstrated the significant expansion of markets, communications, and transportation networks after the Civil War, which, along with transfer of capital, facilitated a greater exchange of technology. As a result, while southern building technology may have lagged New England's by twenty years or so before the war, this expansion of networks encouraged the South's adoption of factory standards by the end of the century.

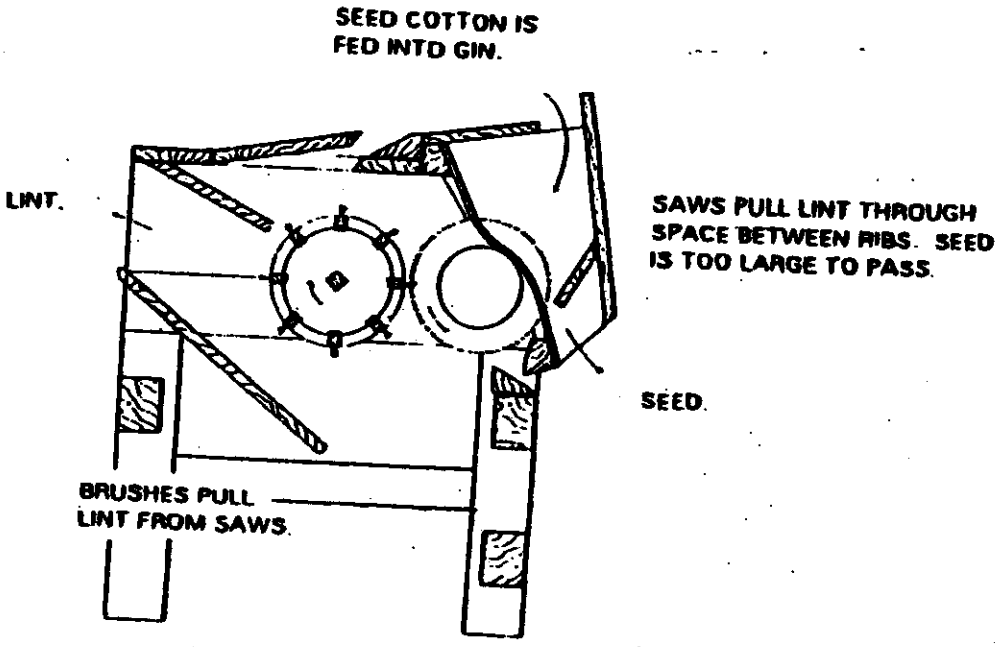
Like other recent work, this case study lends nuance to the first generation of industrial history, which tended toward broad generalizations and overarching teleologies. By looking at three different themes in Continental Gin Company's development -- manufacturing process, power, and architecture -- it becomes clear that industrialization and technological change were influenced by myriad conditions, with some factors weighing heavier than others at different times. In our case study, region, type of factory (one that manufactures agricultural implements), corporate ideology, and method of technological diffusion all affected the way manufacturing, power, and architecture were shaped.

Appendix I
Building Key Plan



*Drawing prepared by Sarah Paschke, HAER Architect, Summer 1997.

Appendix II
Gin Operation



*Drawing prepared by Sarah Paschke, HAER Architect, Summer 1997.

Appendix III
Characteristics of Labor

From the mid- to late-nineteenth century, many of the town's skilled workers haled from the North, particularly New Hampshire, undoubtedly following kinship trails to the South. Elias Robinson and E.S. Morgan, operators of the horse mills factory and the sash, door, and blind factory, respectively, were both from New Hampshire. Amos Smith, gin factory superintendent, Thomas Avery, factory bookkeeper, and William Ormsby, Pratt's personal secretary, also were from New Hampshire. Many other mechanics were related to Pratt or Amos Smith.[81]

Gin company workers earned higher salaries than those at Pratt's textile mill, The Pratt Manufacturing Company, presumably for the greater skill requirements.[82] Pratt also used slave labor in his factories, though the extent of the practice is unknown. One slave, Jim, apparently served as a semi-skilled helper for mechanic Ferdinand Smith, assisting him in "getting out" and dressing lumber.[83] Additionally, evidence of child labor shows up in the 1870, 1880, and 1900 census manuscripts. Manuscripts show two children in 1870, nine in 1880, and five to seven in 1900.[84]

The number of employees in the gin company, as indicated by the U.S. Census of Manufactures, is shown below.

Year	Employees
1850	31
1860	74
1870	48
1880	71
1900	192 to 278

The reliability of a particular year's census data is questionable due to varying interpretations of questions.

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[81]Evans, 75; U.S. Bureau of the Census, 1850, *7th Census of the United States, Manufactures* (manuscripts), Alabama Department of Archives and History (hereafter referred to as ADAH).

[82]Evans, 78.

[83]Evans, 80-81.

[84]U.S. Bureau of the Census, 1870, *9th Census of the United States, Wealth and Industry* (manuscripts), ADAH; U.S. Bureau of the Census, 1880, *10th Census of the United States, Manufactures* (manuscripts), ADAH; U.S. Bureau of the Census, 1902, *12th Census of the United States, Manufactures* (manuscripts), ADAH.

Particular to labor, problems include the extent to which "hands employed" reflects full-time versus part-time work and whether the labor figures include supervisory personnel, clerical help, or managers.[85] Despite these problems, the trend toward increasing labor requirements is discernable. The greatest increase in personnel, between 1880 and 1900 (besides reflecting a twenty-year jump) reflects the company's late nineteenth-century production expansion and consequent labor needs.

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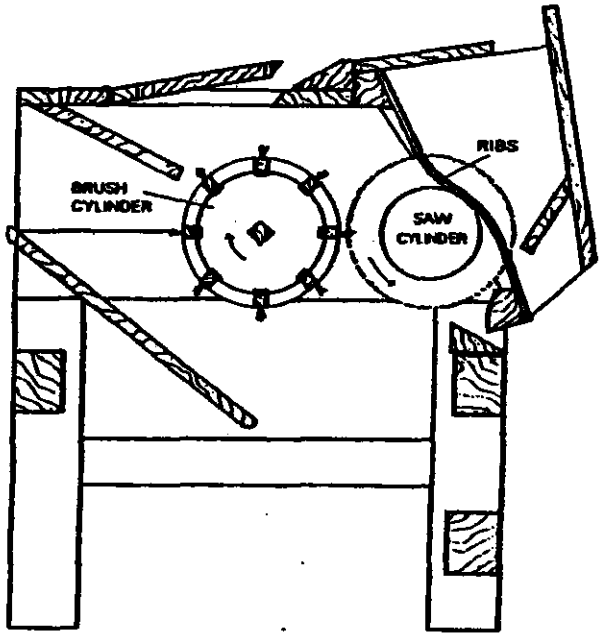
[85]Fred Bateman and Thomas Weiss, *A Deplorable Scarcity: The Failure of Industrialization in the Slave Economy* (Chapel Hill: UNC Press), 168. Some of these problems were addressed in the 1900 census, which included a breakdown of labor type and employment by month. The 1900 data's variation in employment in the above table reflects this method of data collection. No 1890 manuscript census data is available, as the documents were destroyed.

Appendix IV
Changes in Gin and Accessory Production

Year	Gins	Feeders	Condensers	Elevators	Presses
1850	500				
1860	1500				
1870	1000				
1880	622	228	217		
1900	1288	1000	563	225	200

Appendix V
Gin Parts



*Drawing prepared by Sarah Paschke, HAER Architect, Summer 1997.

Appendix VI
Manufacturing Organization

Bldg	Prior to 1848	1848	1857	1911	late 1930s	1954	1984
1A (©1848)	(prior building was flour and grist mill [built about 1840])	sash, door, and blind	sash, door, and blind	1st -- planing 2nd -- bench work 3rd -- saw filing	1st -- men's shower 2nd -- storage 3rd -- gin saws		1st -- lockers and shower 2nd -- lockers and shower? 3rd -- storage
1B (©1852)			grist mill, machine shop for foundry, carpenters shop, horse mills, and carriage and wagon shop	basement -- stock 1st -- machine shop 2nd -- carpenter shop (curved portion -- pattern shop) 3rd -- tin shop	1st -- machine shop/repair sales office 2nd -- pattern and template storage 3rd -- sheet metal work	Basement -- storage 1st -- machine shop 2nd -- storage metal parts 3rd -- storage metal parts and dimensional lumber	basement -- storage 1st -- storage and gin repair 2nd -- storage 3rd -- storage
2 (1854)	(prior to 1854, gin manufactory was on east side in 2-story building)		1st -- machinery 2nd -- breasting and finishing gins; has large room partitioned off to test gins with seed cotton 3rd -- painting, varnishing, put in order for boxing and shipping	1st -- machine shop (curved portion -- woodturning) 2nd -- finishing (curved portion -- planing) 3rd -- painting	1st -- machine shop and tool room 2nd -- plating ribs, assembled gins and saw cylinders, and trained saws (L-portion -- brush assembly) 3rd -- painting, crating	1st -- machine shop 2nd -- gin assembly 3rd -- spraying, painting, varnishing	1st -- machine shop 2nd -- storage 3rd -- storage
3 (1898)				1st -- woodworking and press building 2nd -- woodworking 3rd -- storage	1st -- heavy metal fabrication, welding shop 2nd floor -- fan assembly, assembled feeders and extractors 3rd -- crating	1st -- welding and fabricating 2nd -- gin assembly and storage parts in process 3rd -- gin assembly and crating	1st -- brush making and assembly 2nd -- storage 3rd -- storage
4 (1911)						1st -- storage finished gin machine parts, mill supplies 2nd -- storage finished gin machine parts 3rd -- storage finished gin machines 4th -- storage finished gin machines	storage

Appendix VII
Building Construction

COMPONENT		c.1848	c.1852	1854	1898	1912
FLOORING	description	2 layer tongus and groove -- top diagonal	2 layer tongue and groove -- top diagonal	2 layers of timber tongue and groove flooring -- top layer laid diagonally	2 layers of timber flooring -- top diagonal	2 layers of timber flooring. Top runs in short dimension, sublayer runs along long dimension
	thickness	2-1/4" total	2-1/4" total	2-1/4" total	2nd floor: 4-3/4" 3rd floor: 6"	2-1/2" total
	board width	varies, typical 3" to 6"	varies, typical 3" to 6"	varies, but older boards appear to be 6"	varies	3-1/2"
JOISTS 2nd FLOOR	size	10"x3"	11-3/8"x3-7/8"	1'1"x2"	No joists; beams only	No joists
	spacing	5@6' spacing		2' spacing		
JOISTS 3rd FLOOR	size	4"x3"	11-3/4"x2-1/4"	1'0"x2"	No joists; beams only	No joists
	spacing	13@20" spacing		2' spacing		
JOISTS 4th FLOOR	size	4"x3"x2-1/2"	9-3/4"x2-1/2"	(attic) 8"x1-1/2"	No joists; beams only	No joists
	spacing	13@20" spacing		2' spacing		
FLOOR BEAMS	1st floor	concrete slab	concrete slab	concrete slab	concrete slab	1'5-3/4"x1'10"
	2nd floor	12"x10"	1'x1'4-3/4"	1'3"x1'0"	1'4"x1'1/2"	1'5-3/4"x1'10"
	3rd floor	13"x10"	9-3/4"x9"	1'1"x11-3/4"	1'5-3/4"x1'1-1/2"	1'5-3/4"x1'10"
	4th floor	10"x10"	9-3/4"x9"	—		1'5"x1'10"
POST-COLUMN CONNECTION DETAIL		post bears directly onto beam -- no connector plate (butt joint)	post bears directly onto beam -- no connector plate (butt joint)	post bears directly onto beam -- no connector plate (butt joints)	steel connector plate between post and beam	steel connector plate between post and beam
MASONRY WALL THICKNESS	1st floor	1'6"	1'6"	1'4"	2'2-3/4"	1'9"
	2nd floor	1'6"	1'6"	1'4"	1'10-1/2"	1'
	3rd floor	1'	1'	1'	1'8-3/4"	1'
	4th floor					9"
BRICK PIERS		brick piers in basement centered on beams above	no piers	no attached piers, but 3rd floor beam bears onto brick wall below. 2nd floor beam is housed into brickwork.	Piers on inside and outside (from discussion with C. and D.	Pier attached on exterior.

ROOF FRAMING		6"x2-1/2" rafters bituminoua roofing center post	6"x2-1/2" rafters bituminous roofing	roof trussed: roof frame with king post trusses to length of bldg and queen post trusses at dog leg. Strutted corner post makes tha transition between the two truss types.		1'1"x10" beam. 1'x7-1/2" boarda. Covered by bituminous roofing.
ROOF PITCH		35	35	25 (32-1/2 pitch on one sida of roof return at dog leg end of bldg. Change in pitch to accommodate change in building width.)	15	9
WINDOW TYPE		Timber-framed sash window	Timber-framed sash window	Timber-framed sash window. 12 lights (12 over 12) (8 lights to upper sash on upper level; 8 over 8)	Timber-framed sash window. 12 lights (12 over 12) (8 lights to upper sash on upper level; 8 over 8)	Cast-iron frames. 20 lights on floor 1,2,3. 16 lights on 4th.
WINDOW SIZE	1st floor	71"x4'	5'11"x4'	6'10"x4'2"	5'6-1/2"x8'2"	4'x7'10"
	2nd floor	71"x4'	71"x4'	6'10"x4'2"	5'6-1/2"x8'3"	4'x7'10"
	3rd floor	73-1/2"x4'	6'3/4"x4'	6'x4'2"	5'6-1/2"x8'2-1/2"	4'x7'10"
	4th floor					4'x6'3-3/4"
WINDOW LINTEL/SILL CONSTRUCTION		cast iron	caat Iron	cast iron	granite	
BUILDING WIDTH		29'	29'	51'	63'3"	about 59'
NUMBER OF LEVELS		3 plus attic	3 plus basement and attic	3 plus attic	3	4 plus basement
COLUMNS	1st floor	9-1/4" square	10" square	11-1/2" square	1'2" squara	1'1" squara
	2nd floor	9-1/4" square	10" square	9-1/2" square	10-1/2" square	11" square
	3rd floor	no columns	no columns	9-1/2" square	7-1/2" squara	9-1/4" square
	4th floor					7-1/4" squara

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